

Application Number 10/691,512
Amendment dated July 22, 2005
Reply to Office action of April 22, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently amended): A control loop diagnostic method comprising:

measuring an error in a control loop over time to determine a power spectral density of said error;

determining a best fit analytical function describing said power spectral density;

measuring a diagnostic value from a difference between said best fit analytical function and said power spectral density of said error; and
outputting said diagnostic value.

Claim 2 (Original): The method as claimed in claim 1, wherein said analytical function describes a poorly-tuned control loop exhibiting resonance around a resonant frequency.

Claim 3 (Original) The method as claimed in claim 2, wherein said analytical function is a second order approximation model defined by a natural frequency, a damping ratio and a variance.

Claim 4 (Original) The method as claimed in claim 3, wherein said analytical function is determined to have substantially a same intensity value for a peak around said natural frequency as said power spectral density and substantially a same slope on at least one side of said peak as said power spectral density.

Claim 5 (Original) The method as claimed in claim 4, wherein said analytical function is automatically determined from said power spectral density.

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Claim 6 (Original) The method as claimed in claim 1, wherein said diagnostic value provides a classification indication of one of tuning error and malfunction of said control loop.

Claim 7 (Original) The method as claimed in claim 2, wherein said diagnostic value provides a classification indication of one of tuning error and malfunction of said control loop.

Claim 8 (Original) The method as claimed in claim 1, further comprising a step of determining from said difference whether corrective response is necessary.

Claim 9 (Original) The method as claimed in claim 2, further comprising a step of determining from said difference whether corrective response is necessary.

Claim 10 (Original) The method as claimed in claim 6, further comprising a step of determining from said difference whether corrective response is necessary.

Claim 11 (Original) The method as claimed in claim 7, further comprising a step of determining from said difference whether corrective response is necessary.

Claim 12. (Currently Amended) A computer readable memory comprising a plurality of instructions which when executed perform the steps of:

- measuring an error in a control loop over time to determine a power spectral density of said error;

- determining a best fit analytical function describing said power spectral density;

- measuring a diagnostic value from a difference between said best fit analytical function and said power spectral density of said error; and

- outputting said diagnostic value

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Claim 13 (Currently Amended) The computer readable memory as claimed in claim 12, wherein said analytical function describes a poorly-tuned control loop exhibiting resonance around a resonant frequency.

Claim 14 (Currently Amended) The computer readable memory as claimed in claim 13, wherein said analytical function is a second order approximation model defined by a natural frequency, a damping ratio and a variance.

Claim 15 (Currently Amended) The computer readable memory as claimed in claim 14, wherein said analytical function is determined to have substantially a same intensity value for a peak around said natural frequency as said power spectral density and substantially a same slope on at least one side of said peak as said power spectral density.

Claim 16 (Currently Amended) The computer readable memory as claimed in claim 12, wherein said diagnostic value provides a classification indication of one of tuning error and malfunction of said control loop.

Claim 17 (Currently Amended) The computer readable memory as claimed in claim 13, wherein said diagnostic value provides a classification indication of one of tuning error and malfunction of said control loop.